Proposed Identification of Environmental Tobacco Smoke as a Toxic Air Contaminant

January 26, 2006

Board Hearing
Sacramento, California

California Environmental Protection Agency

Air Resources Board

Overview
Staff Presentation

- Background
- Environmental Tobacco Smoke Chronology
- Exposure Assessment (Part A)
- Health Effects (Part B)
- Recommendation

Definition of a Toxic Air Contaminant

Background

"...an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health."

HSC Section 39655

Toxic Air Contaminants Program

Background

- Identification
- Risk Management

TAC Identification
Health & Safety Code Requirements

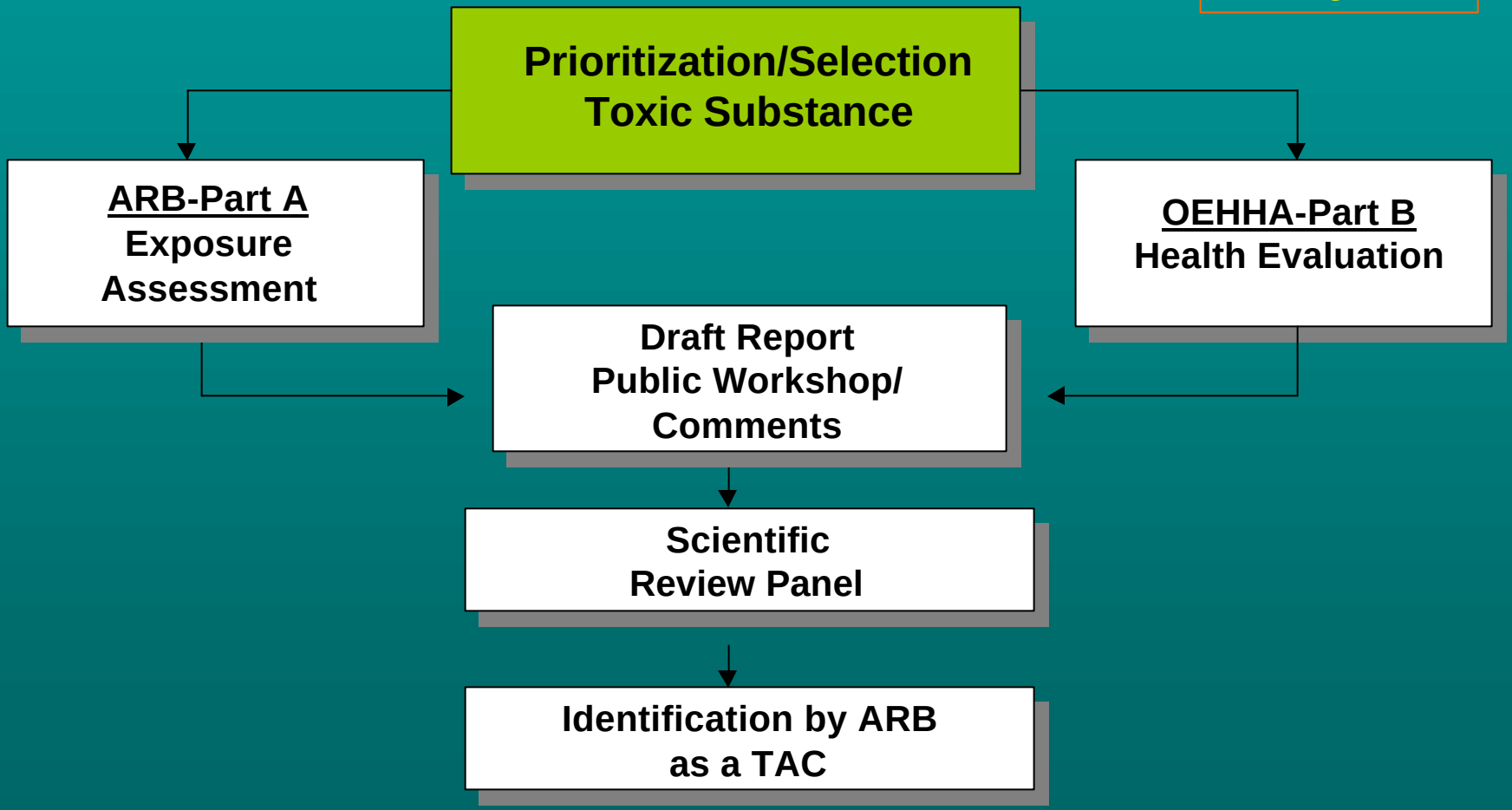
Background

- Requires ARB to develop exposure assessment
- Requires OEHHA to use all available scientific data to assess health effects
  - threshold determination
- SB 25 requires ARB to consider special exposure patterns for children and infants
- SB 25 requires OEHHA to evaluate special susceptibility of infants and children

Toxic Air Contaminants Program

Identification

Background



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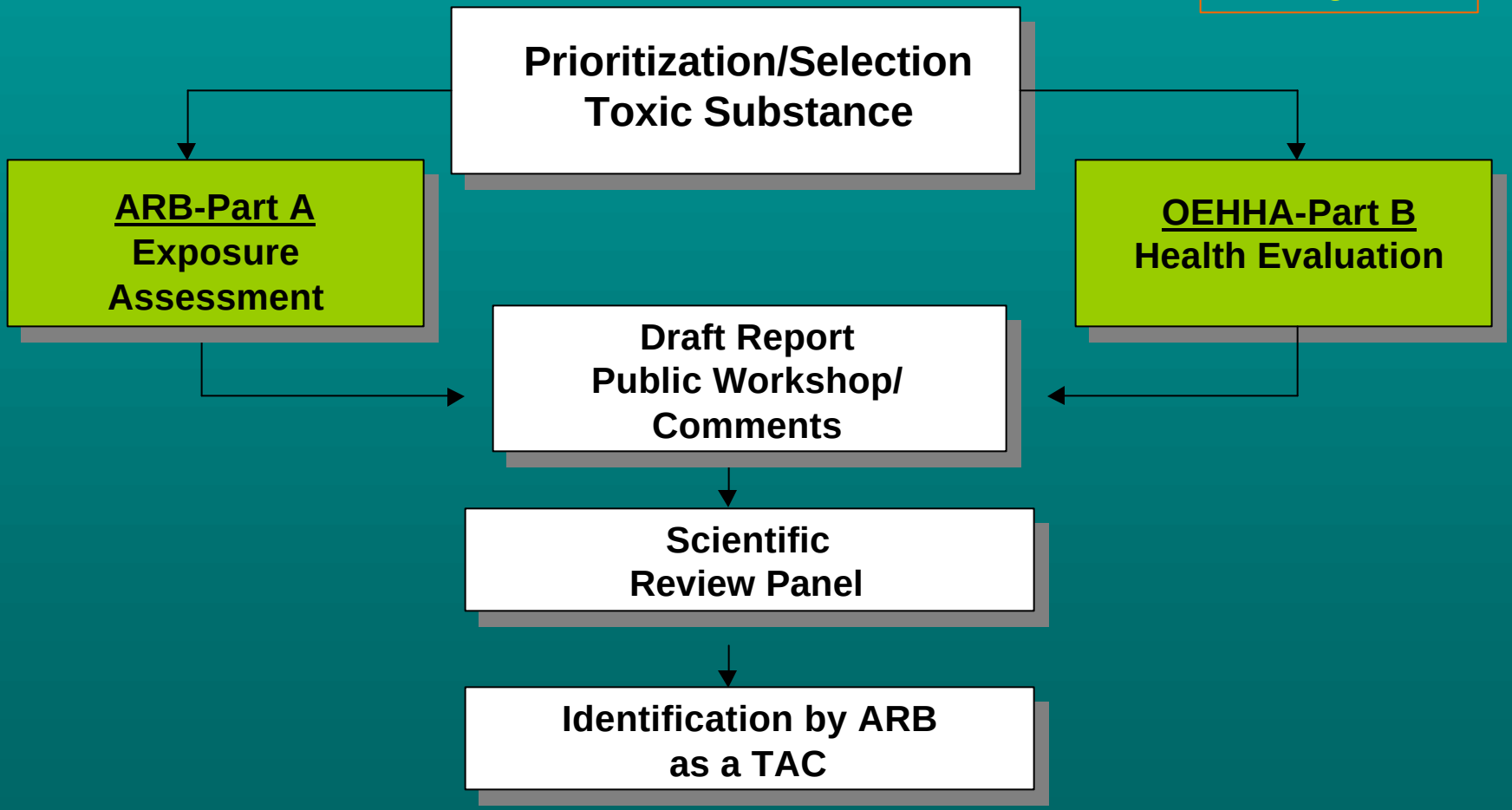

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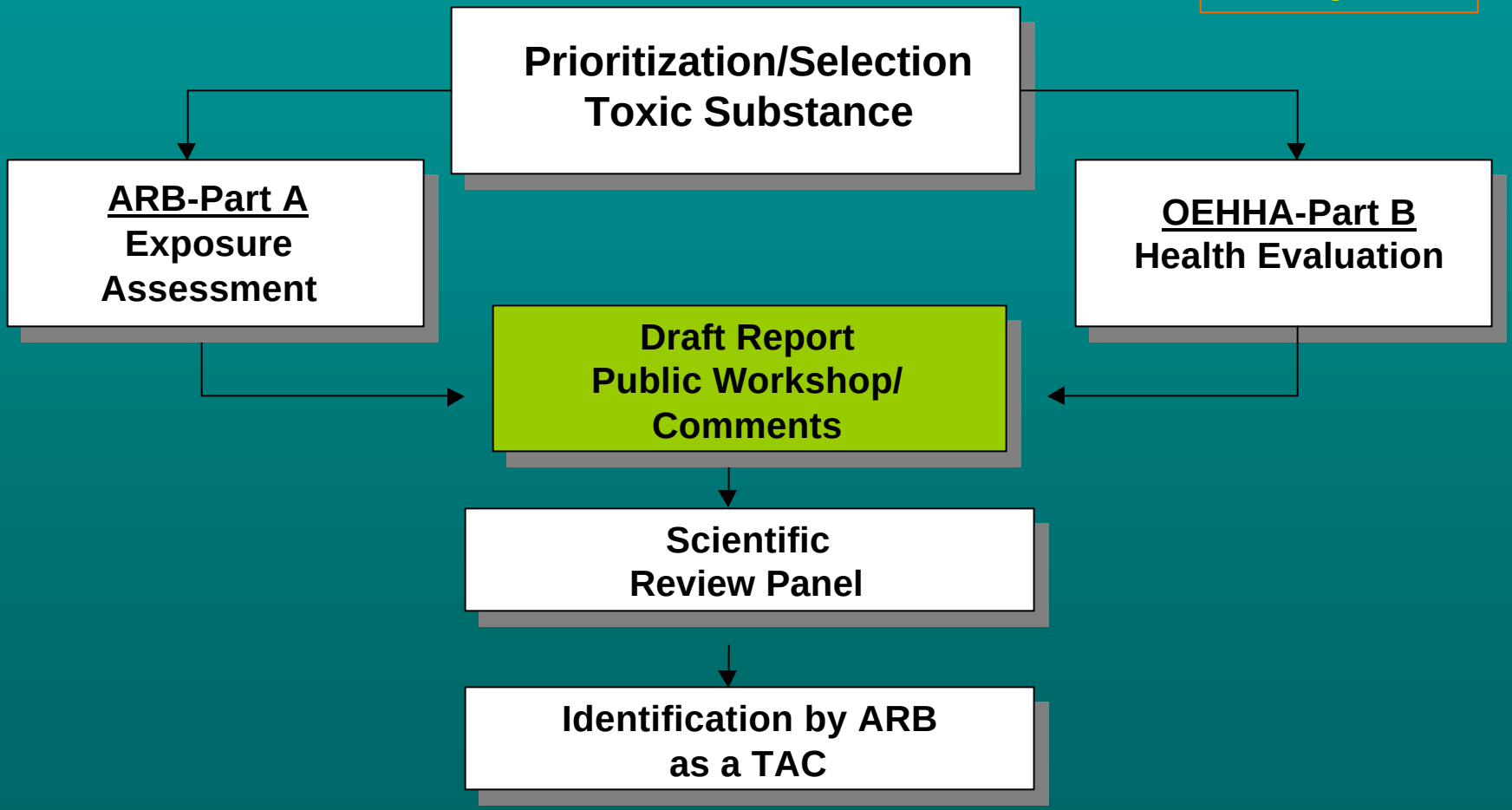

Toxic Air Contaminants Program

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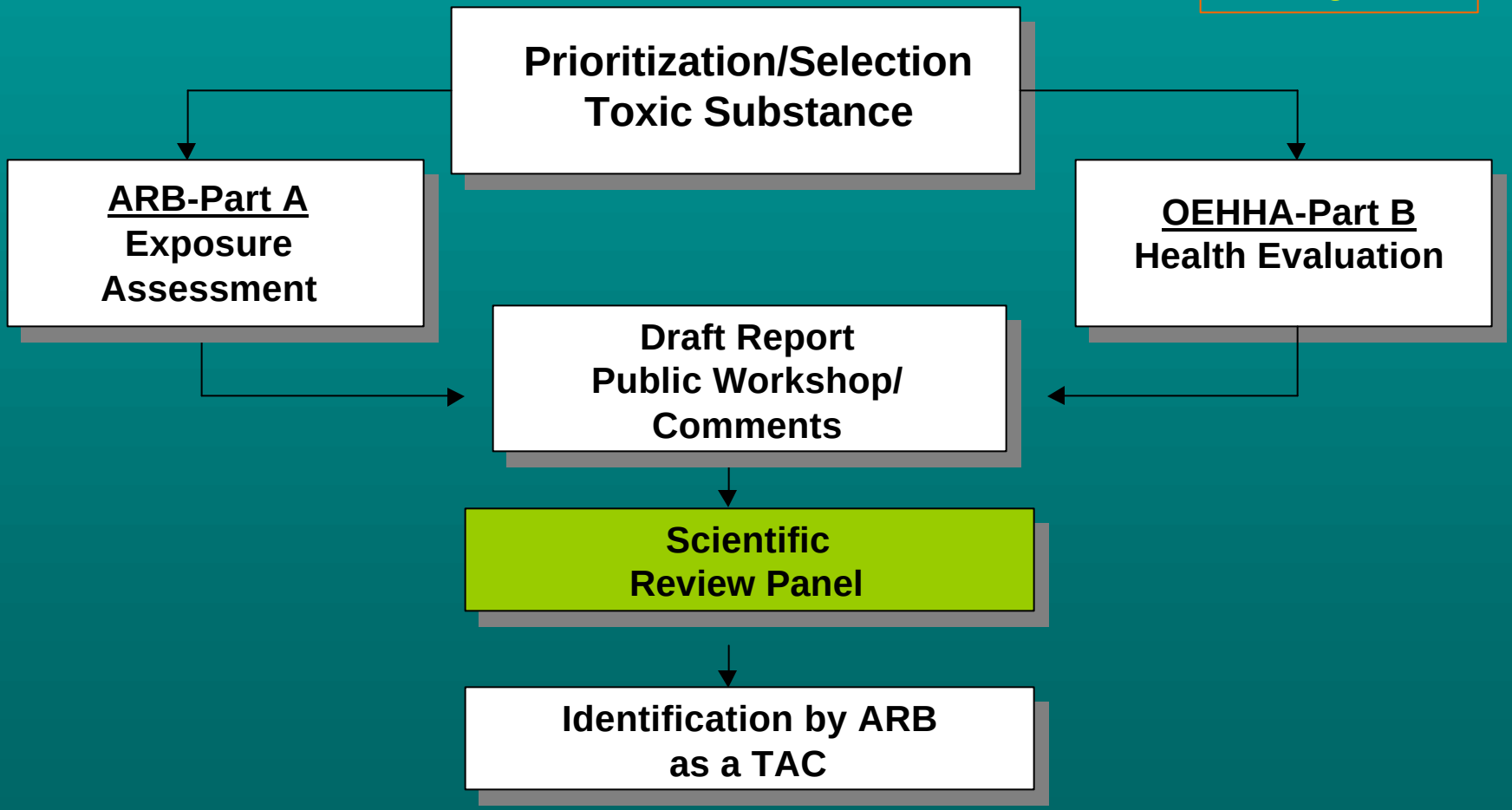

Toxic Air Contaminants Program

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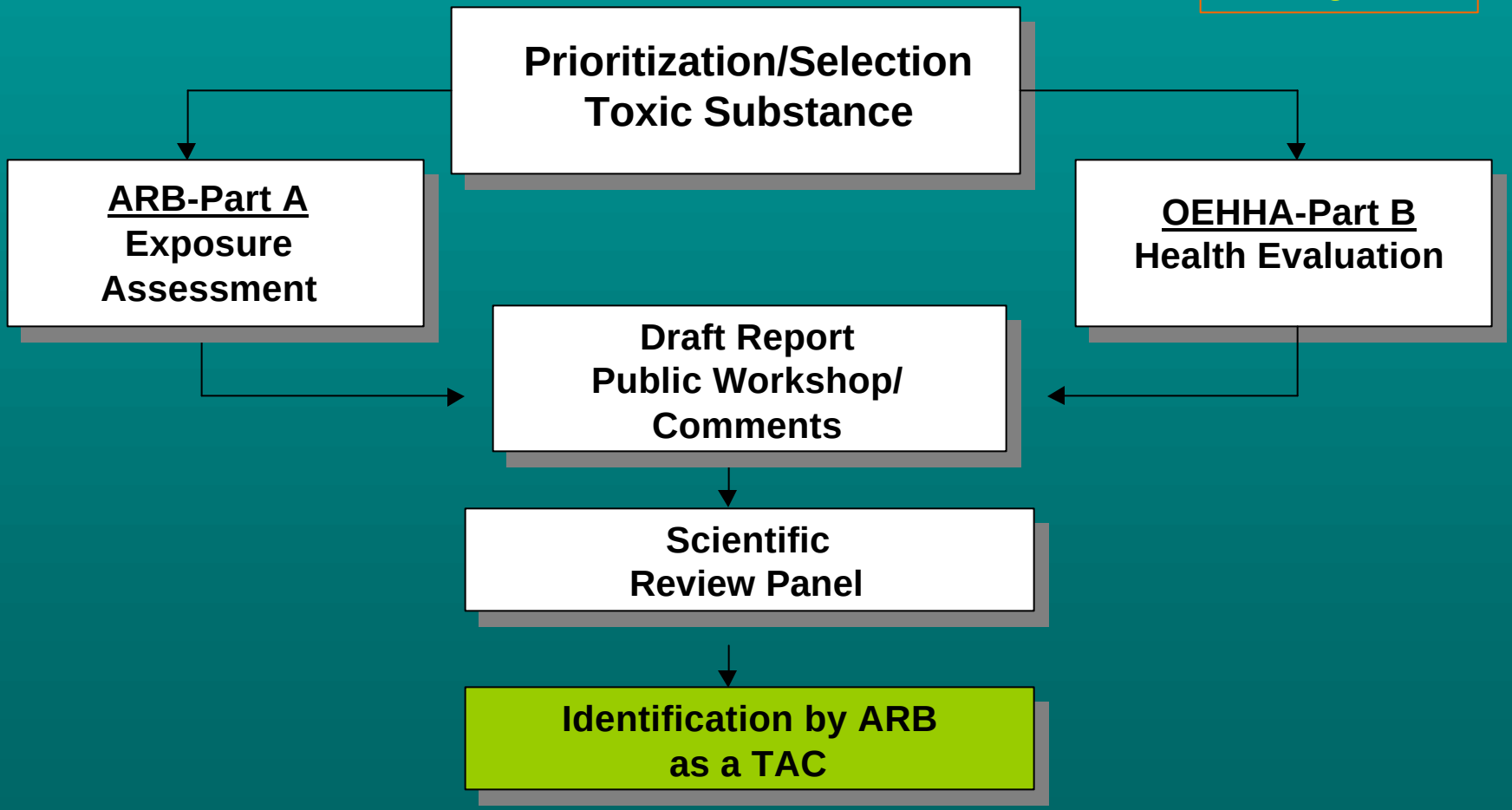
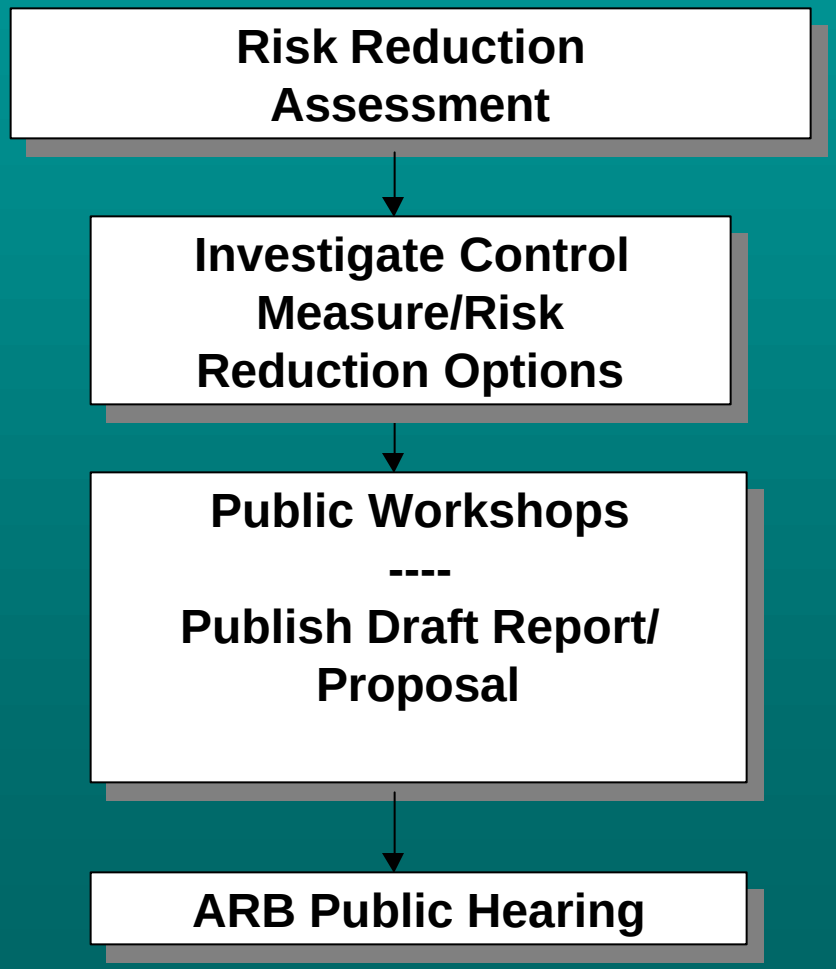


Toxic Air Contaminants Program

Risk Management

Background



California's Toxic Air Contaminants List

Background

- Current regulation contains over 200 toxic air contaminants
- ARB formally identified 22 toxic air contaminants
  - *title 17, CCR, section 93000*
- 189 federal Hazardous Air Pollutants were added to the toxic air contaminants list in 1992
  - *title 17, CCR, section 93001*

Part A
Exposure Assessment

Environmental Tobacco Smoke Chronology

Summer 2001	ARB requested public information and OEHHA assistance
January 2003–June 2003	ARB ambient nicotine monitoring study
December 2003	1st ETS draft report released for 100-day public comment period
March 2004	Public workshop
November 2004–June 2005	Scientific Review Panel holds four meetings to discuss/approve the ETS report
January 2006	ARB hearing to consider identification

Part A - Exposure Assessment

- Chemical & Physical Characteristics
  - properties
- Sources & Emissions
  - California smokers
  - emissions
- Exposure Evaluation
  - ARB near-source air monitoring study
  - indoor studies
  - outdoor studies
  - personal exposure estimate
- Summary

Properties

Chemical & Physical Characteristics

- ETS is smoldering tobacco and exhaled smoke
- Complex mixture of 1000’s of gases and fine particles
- ETS particles mostly range from 0.01 to 1.0 micrometer
- A number of substances have been found to cause cancer
- Many other substances have known adverse non-cancer health effects such as irritant, central nervous system and respiratory effects
- Some ETS constituents persist in the air

California Smokers

Sources & Emissions

- 16% of California adults smoke
  - Compared to 23% nationwide
- 16% of California adolescents smoke
  - Compared to 28% nationwide *

*Source: Am. Lung Assoc., Adolescent Smoking Statistics, Nov. 2003

Emissions

Sources & Emissions

Nicotine:	~ 40 tons per year
$PM_{2.5}$:	~ 365 tons per year
Carbon Monoxide:	~ 1,900 tons per year

ARB Near-Source Air Monitoring Study

Exposure Evaluation

- Nicotine used as a surrogate for ETS
- Monitored at five outdoor locations
- Most smoking locations had elevated nicotine concentrations over measured background levels
- Results show concentration depends on location and number of cigarettes smoked

Outdoor Studies

Exposure Evaluation

- Several studies on outdoor ETS levels
- ARB's near-source nicotine monitoring study shows consistent results with reported studies
- ARB's highest nicotine monitoring results are comparable to those found in some smokers' homes

Indoor Studies

Exposure Evaluation

- Reviewed numerous studies
- Smokers' homes can have indoor nicotine levels averaging about 30 times higher than a non-smokers' home
- In-vehicle respirable particle concentrations range up to 10 times higher than those found in some smokers' homes

Personal Exposure Estimate

Exposure Evaluation

- Estimate range of potential individual exposures
- Uses indoor and outdoor ETS concentrations to identify current range of individual exposure
- Incorporates realistic activity patterns for both children and adults
- Considers time spent in smoking areas

Personal Exposure Estimate
Results

Exposure Evaluation

- Wide range of potential exposures
- Low exposures occur when people have brief ETS encounters
  - daily average nicotine concentration estimated to be slightly less than 0.01 µg/m^3
- For children and adults, estimated average exposure concentrations are hundreds of times higher for those living with smokers
  - daily average nicotine concentration estimated to be 1.8 µg/m^3
  - depending on a person's exposure pattern, daily average nicotine concentration can be 7.4 µg/m^3, or much higher

Summary

- ETS is smoldering tobacco and exhaled smoke
- ETS is a complex mixture of respirable gases and particles, many with adverse health effects
- Indoor and outdoor studies confirm that Californians are exposed to ETS
- Smokers' homes can have indoor nicotine levels 30 times higher than non-smokers
- Smokers' in-vehicle levels are about 10 times higher than in some smokers' homes
- Some outdoor near-source levels of ETS are comparable to those found in smokers' homes

Health Effects of Exposure to Environmental Tobacco Smoke

Office of Environmental Health Hazard Assessment (OEHHA)

Presentation to the Air Resources Board

January 26, 2006

Health Effects of ETS

- OEHHA evaluated the health effects of ETS and prepared a document in 1997 which underwent public and peer review and was subsequently published by the National Cancer Institute
- In the 1997 document, health effects of ETS exposure were described based primarily on epidemiological studies
- ARB entered ETS into the TAC process which triggered an update of the 1997 report

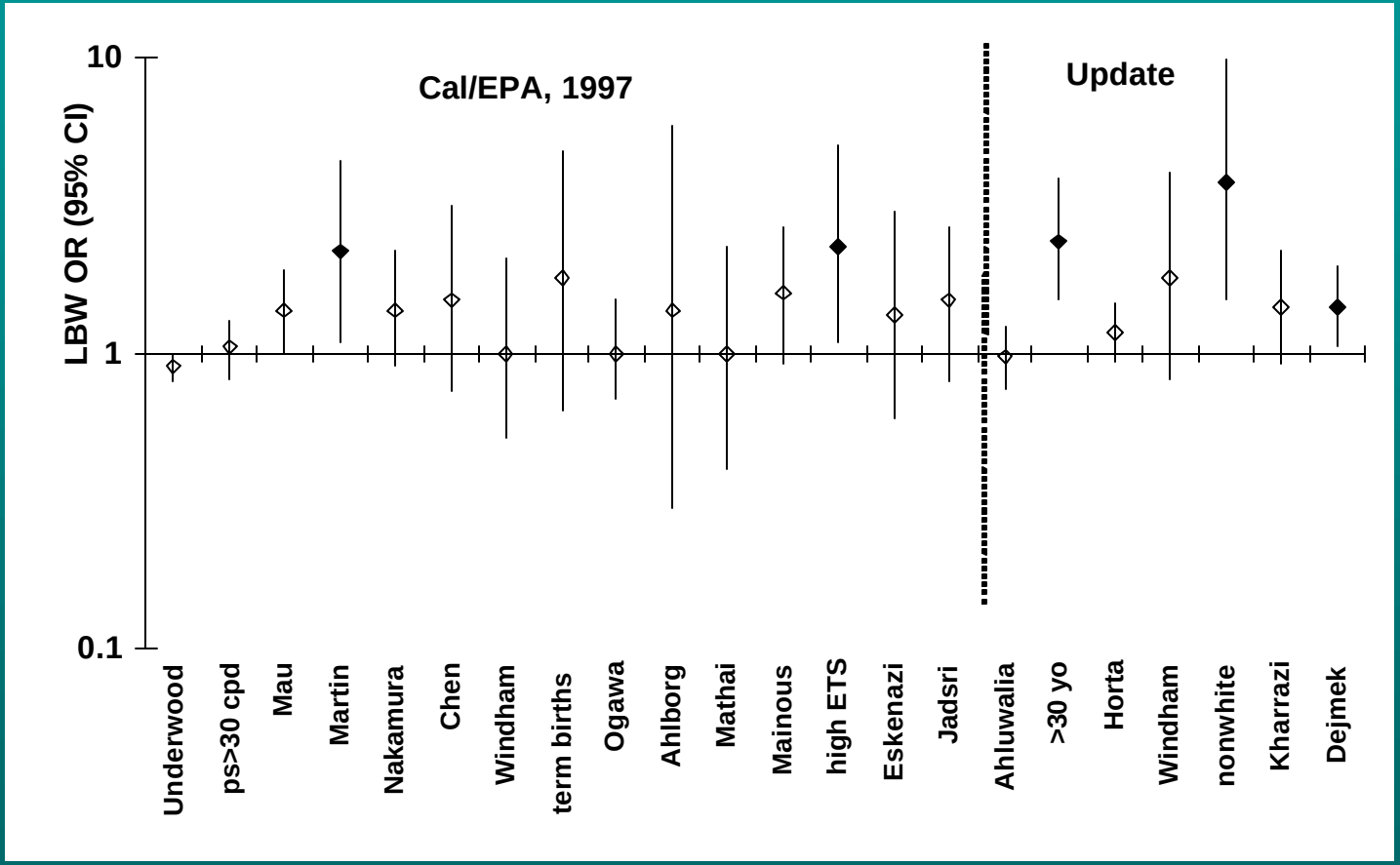
Health Effects of ETS

- OEHHA conducted an exhaustive literature search focusing on studies published since the 1997 report
- The Children's Environmental Health Protection Act (SB 25) requires OEHHA to consider special susceptibilities of infants and children
- We utilized a weight-of-evidence approach to develop findings on the health effects of ETS
- Information in the 1997 report and in the update provided the basis of our conclusions

Health Effects Causally Associated with Exposure to ETS – Infants and Children

- Effects of Pre- and Postnatal Exposure
  - Sudden Infant Death Syndrome (1997 conclusion reaffirmed)
- Effects of Prenatal Exposure
  - Fetal growth: Low birthweight (i.e., under 2500 grams) and decrease in birthweight (reaffirmed)
  - Pre-term delivery (new conclusion)

ETS and Risk of Low Birth Weight



↵ Statistically significant
↓ Statistically non-significant

ETS and Risk of Preterm Delivery

- Several new studies demonstrated elevated risk of pre-term delivery when mothers were exposed to ETS
- Evidence of increasing risk with increasing exposure
- Some evidence that effect is worse in older (>30 years) mothers

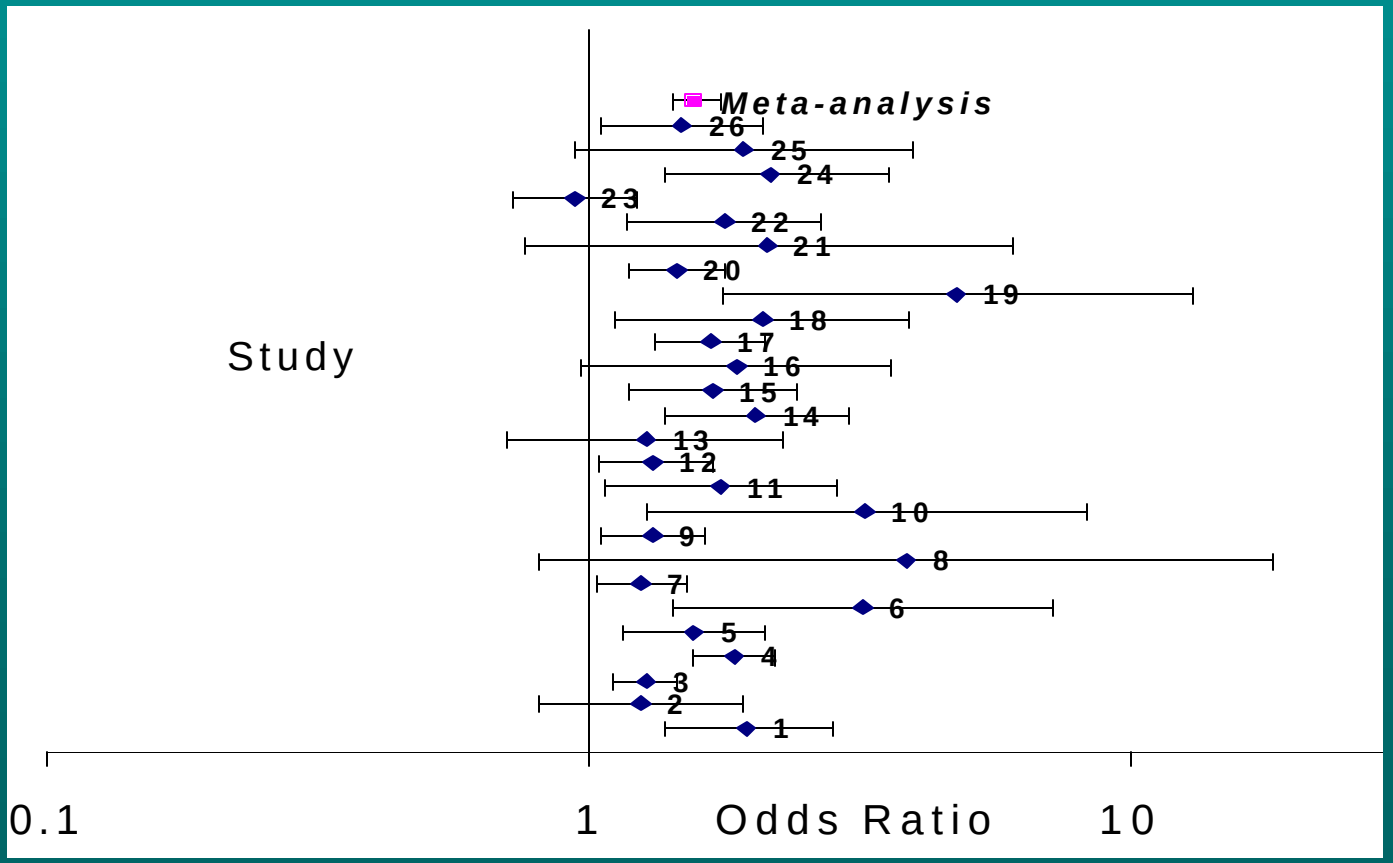
Health Effects Causally Associated with Exposure to ETS – Infants and Children

- Respiratory Effects
  - Acute lower respiratory tract (e.g., bronchitis and pneumonia) and middle ear infections in children (reaffirmed)
  - Asthma induction and exacerbation in children (reaffirmed)
  - Chronic respiratory symptoms in children (reaffirmed)

ETS and Asthma Induction in Children

- OEHHA's updated meta-analysis
  - Indicates that children exposed to ETS are on average 1.3 fold more likely to develop asthma
  - While preschool children appeared to be more at risk, older children exposed to ETS were also at significant risk for new onset asthma, particularly with longer term exposure
- New data and analysis **strongly support the OEHHA 1997 conclusion** that ETS exposure is causally associated with new-onset asthma among children

Respiratory Illness in Children: Either vs Neither Parent Smoking (Strachan and Cook 1997)



Attributable Risks Associated with ETS

Conclusion		
Outcome	**Annual Excess # in CA**	**Annual Excess # in US**
Pregnancy: Low birth weight Pre-term delivery	 1,600 4,700	 24,500 71,900
SIDS	21	430
Asthma (in children) # Episodes	31,000	202,300

Attributable Risks Associated with ETS

Conclusion		
Outcome	**Annual Excess # in CA**	**Annual Excess # in US**
Lower respiratory illness	18,000-36,000	150,000-300,000
Otitis media visits	50,200	790,000

Health Effects Causally Associated with Exposure to ETS – Adults

- Cardiovascular Effects
  - Heart disease mortality (reaffirmed)
  - Acute and chronic coronary heart disease morbidity (reaffirmed)
  - Altered vascular properties (new conclusion)
- Asthma induction and exacerbation in adults (new conclusion)
- Eye and nasal irritation in adults (reaffirmed)

Asthma in Adults: Summary

- Current studies provide **conclusive evidence** that ETS exposure can induce and exacerbate asthma in adults
- Eight of nine recent studies showed significantly increased risk for adult-onset asthma in one or both genders
- Although there are fewer studies than in children, the data consistently link ETS exposure with poorer status among asthmatic adults
- Evidence of dose response. Data consistent with evidence in children

Health Effects Causally Associated with Exposure to ETS

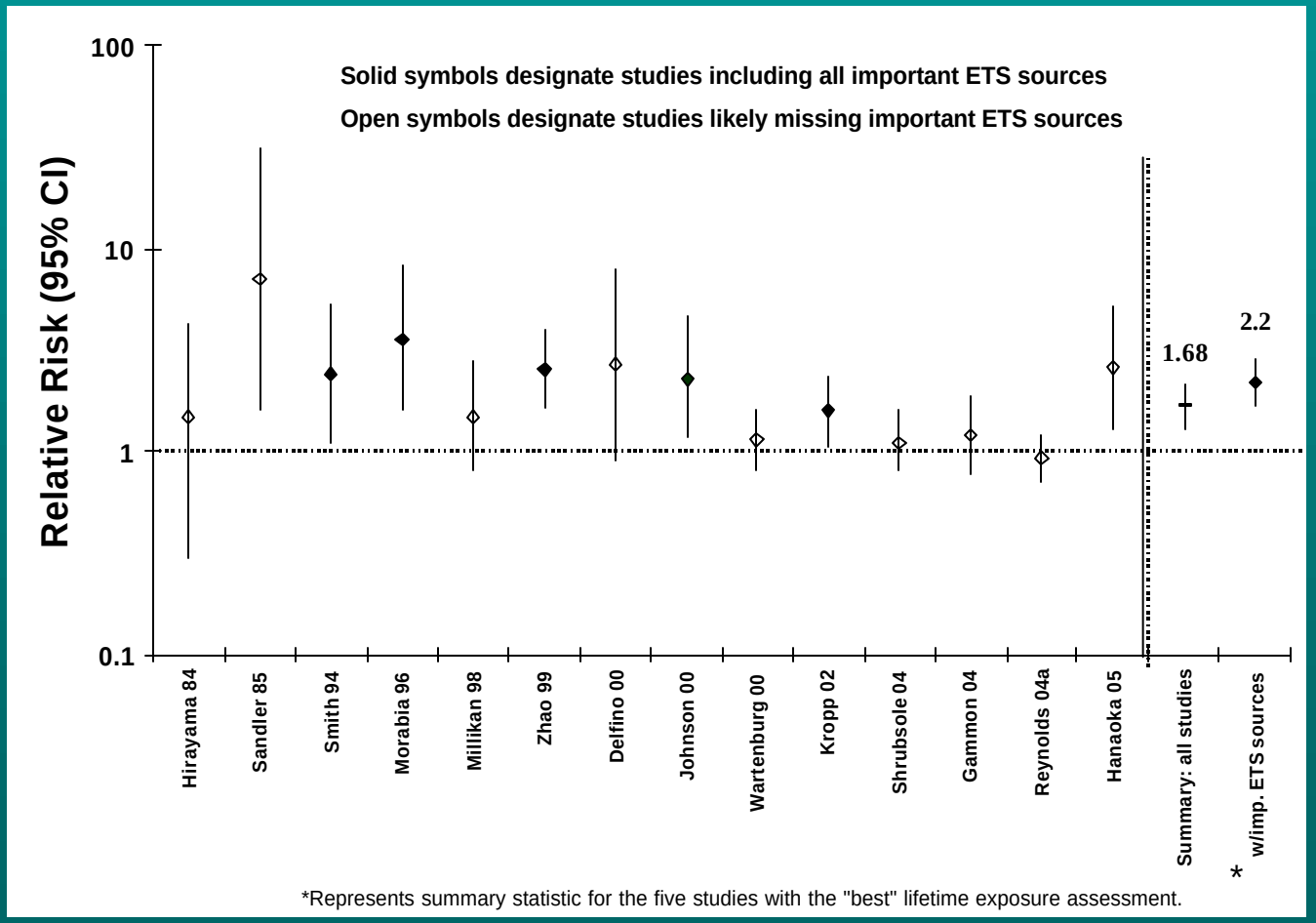
- Carcinogenic Effects
  - Lung cancer (reaffirmed)
  - Nasal sinus cancer (reaffirmed)
  - Breast cancer in younger, primarily pre-menopausal women (new conclusion)
- **No threshold identified for carcinogenic effects**

Conclusions – Breast Cancer

- “Overall, the weight of evidence (including toxicology of tobacco smoke constituents, epidemiological studies, and breast biology) is consistent with a causal association between ETS exposure and breast cancer in younger, primarily premenopausal women”

- “… we conclude that further research is necessary to characterize ETS associated breast cancer risk in postmenopausal women and the evidence to date is considered inconclusive”

Summary risk estimates for ETS and breast cancer in younger/premenopausal women



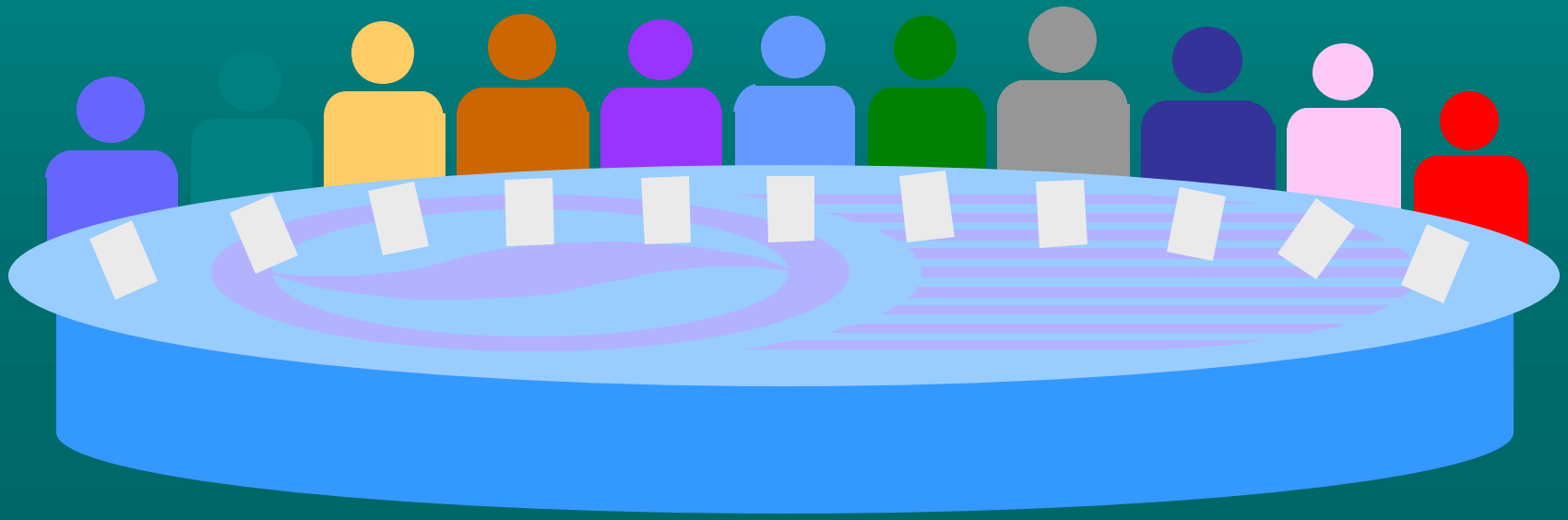
*Represents summary statistic for the five studies with the "best" lifetime exposure assessment.

Attributable Risks Associated with ETS

Conclusion Update		
Outcome	**Annual Excess # in CA**	**Annual Excess # in US**
Cardiac death (Ischemic heart disease death)	3,600 (range: 1,700-5,500)	46,000 (range: 22,700-69,600)
Lung cancer death	400	3,400

Recommendation

- Adopt regulatory amendment identifying environmental tobacco smoke as a toxic air contaminant



Next Steps

- Prepare risk reduction report
- Review state and local anti-smoking programs
- Review public education efforts
- Identify additional opportunities
- Obtain data to better characterize the public’s exposure